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1 1. A targeting cell comprising a vector, said
2 vector comprising a nucleic acid sequence encoding a fusion
3 protein, said fusion protein comprising:
4 (a) a targeting domain comprising a first member of
5 an affinity pair; and
6 (b) a toxic domain comprising a toxic molecule,
7 wherein said targeting cell has significant binding
8 affinity for a pathogenic cell, said targeting cell
9 expressing and secreting said fusion protein, and said
10 first member binds to a second member of said affinity
11 pair, said second member being expressed on a surface of
12 the pathogenic cell.

1 2. The targeting cell of claim 1, wherein said
2 first member is a cytokine.

1 3. The targeting cell of claim 1, wherein said
2 first member is selected from the group consisting of an
3 antigen, a ligand for a cell adhesion receptor, a ligand
4 for a signal transduction receptor, a hormone, and a
5 molecule that binds to a death domain family molecule.

1 4. The targeting cell of claim 2, wherein said
2 cytokine is interleukin (IL)-4.

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1 12. The targeting cell of claim 10, wherein said
2 cancer cell is selected from the group consisting of a
3 neural tissue cancer cell, a melanoma cell, a breast cancer
4 cell, a lung cancer cell, a gastrointestinal cancer cell,
5 an ovarian cancer cell, a testicular cancer cell, a lung
6 cancer cell, a prostate cancer cell, a cervical cancer
7 cell, a bladder cancer cell, a vaginal cancer cell, a liver
8 cancer cell, a renal cancer cell, a bone cancer cell, and a
9 vascular tissue cancer cell.

1 13. The targeting cell of claim 1, wherein said
2 pathogenic cell is associated with pathogenesis of an
3 autoimmune disease.

1 14. The targeting cell of claim 13, wherein said
2 pathogenic cell is selected from the group consisting of a
3 CD4+ T lymphocyte, a CD8+ T lymphocyte, a B lymphocyte, a
4 monocyte, and a macrophage.

Sub C2 → 1 15. The targeting cell of claim 1, wherein said
2 targeting cell is a CD8+ T lymphocyte.

1 16. The targeting cell of claim 1, wherein said
2 targeting cell is selected from the group consisting of a
3 CD4+ T lymphocyte, a B lymphocyte, a natural killer (NK)
4 cell, a lymphokine-activated killer (LAK) cell, a monocyte,
5 and a macrophage.

Sub B' → 1 17. The targeting cell of claim 1, wherein said
2 toxic molecule is diphtheria toxin (DT).

1 18. The targeting cell of claim 17, wherein said
2 toxic molecule comprises amino acids 1-390 of DT.

Sub B² 19. The targeting cell of claim 1, wherein said
2 toxic molecule is selected from the group consisting of
3 ricin, *Pseudomonas* exotoxin (PE), bryodin, gelonin, α-
4 sarcin, aspergillin, restrictocin, angiogenin, *Pseudomonas*
5 exotoxin, saporin, abrin, and pokeweed antiviral protein
6 (PAP).

1 20. The targeting cell of claim 1, wherein the
2 vector is a retroviral vector.

1 21. The targeting cell of claim 1, wherein the
2 vector is selected from the group consisting of a plasmid,
3 an adenoviral vector, a adeno-associated viral vector, a
4 vaccinia viral vector, a lentiviral vector, and a herpes
5 viral vector.

Sub C³ 22. A population of cells, wherein each of a
2 substantial number of said cells of said population is said
3 targeting cell of claim 1.

Sub a¹ 23. The targeting cell of claim 1, said vector
2 further comprising, 5' of the 5' end of said encoding
3 sequence, a mammalian signal sequence.

1 24. The targeting cell of claim 23, wherein said
2 signal sequence is a signal sequence encoding a natural
3 leader sequence of said first member.

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1 25. The targeting cell of claim ~~24~~, wherein said
2 first member is IL-4.

1 26. The targeting cell of claim ~~13~~, wherein said
2 autoimmune disease is selected from the group consisting of
3 rheumatoid arthritis (RA), insulin-dependent diabetes
4 mellitus (IDDM), and multiple sclerosis.

1 27. The targeting cell of claim ~~13~~, wherein said
2 autoimmune disease is selected from the group consisting of
3 systemic lupus erythematosus (SLE) and myasthenia ~~gravis~~
4 (MG).

1 28. The targeting cell of claim ~~1~~, wherein said
2 pathogenic cell is a cell that is infected with a
3 microorganism.

1 29. The targeting cell of claim ~~28~~, wherein said
2 microorganism is a virus.

1 30. The targeting cell of claim ~~29~~, wherein said
2 virus is a human immunodeficiency virus (HIV).

1 31. The targeting cell of claim ~~30~~, wherein said
2 first member is selected from the group consisting of CD4,
3 CCR4, and CCR5.

1 32. The targeting cell of claim ~~30~~, wherein said
2 second member is an envelope glycoprotein.

1 33. The targeting cell of claim 28, wherein said
2 microorganism is selected from the group consisting of a
3 bacterium and a protozoan parasite.

Sub C4 > 34. A method of treating a subject with a
2 pathogenic cell disease, said method comprising
3 administering said cell population of claim 20 to said
4 subject.

1 35. A method of treating a subject with a
2 pathogenic cell disease, said method comprising
3 administering a vector to the subject, said vector
4 comprising a nucleic acid sequence encoding a fusion
5 protein including:

6 (a) a targeting domain comprising a first member of
7 an affinity pair or a functional fragment thereof; and

8 (b) a toxic domain comprising a toxic molecule or a
9 functional fragment thereof,

10 wherein said first member binds to a second member
11 of the affinity pair, said second member being expressed on
12 the surface of the pathogenic cell.

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1 C5
2 36. A method of making said cell population of
3 claim 22, the method comprising:

4 (a) providing a cell preparation wherein each of a
5 substantial number of said cells of said preparation has
6 significant binding affinity for a pathogenic cell; and

7 (b) transfecting or transducing said cells of said
8 preparation with a vector comprising a DNA sequence
9 encoding a fusion protein including:

10 (i) a targeting domain comprising a first
11 member of an affinity pair; and

12 (ii) a toxic domain comprising a toxic
13 molecule,

14 wherein, after said transfection or said
15 transduction, a significant number of said cells of said
16 preparation express and secrete the fusion protein, and
17 said first member binds to a second member of the affinity
18 pair, said second member being expressed on a surface of
19 said pathogenic cell.

1 37. The method of claim 36, further comprising,
2 after said transfection or said transduction, enriching for
3 cells expressing and secreting said fusion protein.

Sub 22

1 38. A vector comprising a nucleic acid sequence
2 encoding a fusion protein, said fusion protein comprising:
3 (a) a targeting domain comprising a first member of
4 an affinity pair;
5 (b) a toxic domain comprising a toxic molecule; and
6 (c) transcriptional and translational regulatory
7 sequences operably linked to said DNA sequence, said
8 regulatory sequences allowing for expression of said fusion
9 protein in a cell of a mammal,
10 wherein said first member binds to a second member
11 of said affinity pair, said second member being expressed
12 on a surface of a pathogenic cell.

1 39. The vector of claim 38, further comprising, 5'
2 of the 5' end of said encoding sequence, a signal sequence.

1 40. The vector of claim 39, wherein said signal
2 sequence is a signal sequence encoding a natural leader
3 sequence of said first member.

1 41. The vector of claim 40, wherein said first
2 member is IL-4.

1 42. The vector of claim 38, wherein the vector is a
2 retroviral vector.

Sub 23

1 43. The vector of claim 38, wherein the vector is
2 selected from the group consisting of a plasmid, an
3 adenoviral vector, a adeno-associated viral vector, a
4 vaccinia viral vector, a lentiviral vector, and a herpes
5 viral vector.